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CONTENTS

George Whitefield and the College of New Jersey . 23
The Seminary Commencement 33

SUMMARIES OF PAPERS PUBLISHED.

Report of Experiments on the Reduction of the Tactual Double-point Threshold by Practice, and on Vexirfehler (Double-point Illusion) . . 35
Organic Selection 38
A New Method of Determining the Specific Heat of Liquids 39
On A New Interesting American Fossil 41

REVIEWS OF BOOKS.

"La Pierre de Touche." 42
Elements of Theoretical Physics. 43
Elementary Text Book of Physics 43
An Introduction to Geology 44
Selections from Pierpe Loti 45

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Vol. IX. June, 1897. No. 2.

GEORGE WHITEFIELD AND THE COLLEGE OF NEW JERSEY.

By V. LANSING COLLINS.

The intimacy of George Whitefield with the founders of the College of New Jersey, his material aid during the anxious years of its infancy and the active interest he continued to take in its welfare have been scarcely mentioned by Princeton historians. This is an effort to supply the omission temporarily. A complete account of Whitefield's relation with the College is not possible until certain Scotch and English records are obtained. I have used chiefly Tyerman's Life of Whitefield, London, 1876; Gillies' Memoirs of Whitefield, Hartford, 1845; Belcher's Biography of Whitefield, New York, n. d., and Whitefield's Works, London, 1771.

On May 7, 1738, Whitefield landed at Savannah on the first of his seven visits to America. He was then in his twenty-fourth year. Admitted to holy orders in June, 1736, he received his B.A. at Oxford in July, and it was his intention to remain there for some years to finish his studies and do what good he might in that university town. But letters from his friends the Wesleys, who were in America, fired his soul with missionary zeal, and when Charles Wesley returned to England in December 1736 to procure helpers, and was followed in a few days by a letter from John Wesley to Whitefield directly suggesting mission work in Georgia, the young clergyman decided, in spite of bright prospects at home, to accept what he believed to be a divine call. He desired to set out for his new field at once, but various matters delayed his departure until January, 1738, and even then the ship so loitered on the way that it was March 7 before Gibraltar was left behind and the voyage across the Atlantic to Savannah fairly begun. Whitefield's stay in Georgia lasted but a little more than three months. He was pleasantly surprised in the country, for he wrote home in the only letter preserved of that first visit, "America is not so horrid a place as it is represented to be." He left for England in August "to receive priest's orders and to make a beginning towards laying a foundation to the Orphan-house."*

On October 30, 1739, he landed again in America, at "Lewistown, 150 miles from Philadelphia." It was his intention to buy provisions at Philadelphia for the colony in Georgia, and to preach his way down to Savannah. He reached Philadelphia November 2, and immediately began evangelistic work. His journal for Saturday November 10 contains the first reference that connects his name with Princeton. On his return home from service he "was much comforted by the coming of Mr. Tennent, an old gray-headed disciple." This was the father of the famous brothers William and Gilbert.

*Gillies, 32.

the latter of whom became Whitefield's warmest American friend. Two days later he started for New York, stopping at Burlington, Trenton and New Brunswick. "Here we were much refreshed with the company of Mr. Gilbert Tennent, an eminent dissenting minister about 40 years of age, son of that good man who came to see me on Saturday at Philadelphia." At New Brunswick Whitefield preached in Gilbert Tennent's meeting-house, "for there is no place set apart for the worship of the Church of England." The next day at New York he listened to Tennent, and writes in his journal that he "never before heard such a searching sermon." On the 15th Whitefield faced his first New York audience. The Episcopal authorities had refused him the use of their pulpit; he therefore spoke "in the reverend and worthy Mr. Pemberton's meeting-house."* Seven years later this "Mr. Pemberton" became one of the first trustees of the College of New Jersey. The friendship that sprang up between Pemberton and Whitefield grew to be very strong, and on the latter's death in 1770, Dr. Pemberton preached a memorial sermon in his honor.

On the following Monday, November 19, at five in the morning, Whitefield started on his journey back to Philadelphia. At Elizabeth he met Princeton's future first president, dining "with Mr. Dickinson, a worthy dissenting minister, who had sent a letter of invitation to New York and offered me the use of his meeting-house." On subsequent visits to Elizabeth, Whitefield seems to have lodged with Samuel Woodruff, whose "house was the minister's house,"† and who in 1749 became a trustee of the College of New Jersey. Whitefield preached in Dickinson's meeting-house at noon, and the next day again occupied Gilbert Tennent's pulpit at New Brunswick. On Wednesday November 21 he preached at Maidenhead and at Trenton, starting the next morning for Neshaminy, "where old Mr. Tennent lives and keeps an academy," and where he was to preach. "After our exercises were over we went to old Mr. Tennent, who entertained us like one of the ancient patriarchs." Then follows the well-known description of the Log College. Referring to his experience at Neshaminy, Whitefield subsequently makes this interesting remark: "At Neshaminy I believe there were nearly a thousand horses. The people, however, did not sit upon them to hear the sermon as in England, but tied them to the hedges; and thereby much disorder was prevented."

On his way south Whitefield met at Wilmington another future Princeton trustee. He writes that he "spent the evening in sweet conversation with Mr. William Tennent, brother to Mr. Gilbert Tennent." His new friend accompanied him to Whiteclay Creek, where at noon on Sunday December 2 he preached on invitation of the pastor Charles Tennent, a younger brother of Gilbert and William, to "upwards of ten thousand people. . . there were several hundreds of horses." Throughout his career the size of Whitefield's audiences seems to have been equalled only by the remarkable results of his efforts. It is hard to believe that he was an accurate judge of numbers.

With Whitefield's doings in Georgia, his wordy war with the rector of St. Philips, Charleston, and his curious and unlucky epistolary courtship of a Miss Delamotte we have here nothing to do, except to notice that he found time to open a correspondence with the Tennents and Dr. Pemberton.

In April 1740 he sailed north and landed on the 13th at Newcastle, where he

*In Wall street, and at that time the only Presbyterian church in New York. Belcher, 118.

†Hatfield. History of Elizabeth. N. Y. 1868, 582.

no sooner left the vessel than he was in a pulpit. His friend William Seward went over to Whiteclay Creek after the service to tell Charles Tennent that Whitefield would preach again that afternoon. Whereupon pastor and people closed their meeting-house and rode at full gallop to Newcastle, arriving in time to hear the sermon. Thence Whitefield proceeded to Philadelphia, where he was assisted in his work by Gilbert Tennent. The latter entered into the spirit and style of Whitefield's work more fully than any other American. Later in 1740 he went to Boston as Whitefield's successor, and in 1743 he formed a new church at Philadelphia of Whitefield's converts. The building erected there for Tennent's use became afterwards the seat of the University of Pennsylvania's predecessor.

Whitefield on April 23 revisited Neshaminy, and two days after preached at Amwell where Gilbert Tennent and three other ministers were waiting for him. On the 26th he reached New Brunswick and spent a memorable Sunday there with the faithful Gilbert Tennent's congregation. The next day, April 28, he was at Woodbridge, "dining at the dissenting minister's house." This was the Rev. John Pierson,* subsequently one of Princeton's first trustees. The same day he preached again for Jonathan Dickinson at Elizabeth, and on May 1 he paid a flying visit of a few hours to Long Island, returning in the evening to preach in New York for Ebenezer Pemberton. On the 5th he went to Freehold, meeting Gilbert and William Tennent on the way, and after a week of itinerant preaching he reached Nottingham May 13 with William Tennent "and Mr. Blair." The day following, after preaching at Nottingham to "near twelve thousand," he says he "revived and was strengthened to go with Messrs. Blair, Tennent and some other friends to Mr. Blair's house, twenty miles from Nottingham." Samuel Blair, whose hospitality Whitefield enjoyed that night, became one of the first trustees in Governor Belcher's charter. He had just been installed as pastor at Fagg's Manor, and there Whitefield preached the next morning to an audience as large as that at Nottingham. The occasion must have been well remembered by young Blair; for, says Whitefield, "Some of the people were as pale as death, others were wringing their hands, others lying on the ground, others sinking into the arms of their friends." Whitefield left directly after this for the south.

In the following September he went by boat to New England, landing at Newport, R. I., on the 14th. The Rev. Aaron Burr was at this time in Rhode Island for his health. Whether he met Whitefield during the three days the latter was in Newport I have been unable to ascertain. However, when Whitefield went to Boston on the 18th Burr followed the next day. In Boston he visited Whitefield at least once, and heard him preach several times.*

Governor Belcher had heard that Whitefield was coming to Boston, and had sent his son with a party of friends to escort him into town. There he was welcomed by almost all, says Tyerman, except a famous doctor of divinity, who met him in the streets and said, "I am sorry to see *you* here." "So is the devil" was the reply. The morning after his arrival Whitefield made haste to return the Governor's courtesy by calling on him. "The Governor received me with the utmost respect, and desired to see me as often as I could." Governor Belcher was at this time sixty-eight years old, but his friendship for the young clergyman of twenty-six became as intimate as if they had been equals in rank and years. On

*Hatfield, 341.

*Stearns. First Church In Newark. Newark, 1853. 159.

the 25th he gave a clerical dinner for Whitefield. "After public worship I went at his Excellency's invitation and dined with him. Most of the ministers of the town were invited with me." Referring to this dinner in 1745 Whitefield said: "He honoured me with great honour, and the clergy paid the nod and obeyed. In many, I perceived it was quite forced; and I think, when at his table, I whispered to some one and said: 'If ever I come again, many of those who now seem extremely civil will turn out my open enemies.'" This prediction was curiously verified. Before dinner the Governor had sent for Whitefield "into his chamber. He wept, wished me good luck in the name of the Lord, and recommended himself, ministers and people to my prayers. Immediately after dinner I prayed for them all, and went in his coach to the end of the town." On the 28th Whitefield "had the honour of a private visit from the Governor." On Sunday October 12 he "dined with the Governor, who came to me after dinner when I was retired and weeping most earnestly desired my prayers." Then he "went with the Governor in his coach to the common where I preached my farewell sermon to near twenty thousand people—a sight I have not seen since I left Blackheath. . . . After sermon the Governor went with me to my lodgings. . . . Took his leave of me in the most affectionate manner and said he would come to take me in his coach to Charlestown ferry the morrow morning." Accordingly the next day Whitefield "took an affectionate leave of many dear friends. Went with the Governor in his coach to Charlestown ferry, where he handed me into the boat, kissed me and with tears bid me farewell." The interest Governor Belcher took in Whitefield of course created some sensation. A letter from Boston dated October 22, 1740, and published in the Charleston *South Carolina Gazette*, says: "Mr. Whitefield has not a warmer friend anywhere than in the first man among us. Our Governor can call him nothing less than the apostle Paul. He has shown him the highest respect; carried him in his coach from place to place and could not help following him fifty miles out of town."

From Boston Whitefield went to Concord and on the 14th to Sudbury and Marlborough. "When I came into the meeting-house at Marlborough I turned about and to my surprise saw Governor Belcher there; he was affected, and though it rained and he was much advanced in years, yet he went in company with us as far as Worcester, fifteen miles from Marlborough. . . . We spent the remainder of the day very agreeably with the Governor." On the next day Whitefield writes: "Perceived Governor Belcher to be more affectionate than ever. After morning prayer, he took me by myself and exhorted me to go on in stirring up the ministers; 'for' said he, 'reform must begin at the house of God.' As we were going to meeting he said, 'Mr. Whitefield, do not spare rulers any more than ministers; no, not the chief of them.' . . . After the sermon the Governor remarked, 'I pray God I may apply what has been said to my own heart. Pray, Mr. Whitefield, that I may hunger and thirst after righteousness.' Dinner being ended, with tears in his eyes he kissed me and took leave of me." Whitefield then remarks: "I have observed that I have had greater power than ordinary whenever the Governor has been at public worship."

On the 17th Whitefield reached Northampton, where Jonathan Edwards was pastor. Of Edwards, with whose sermons he was already acquainted, he says: "Mr. Edwards is a solid, excellent Christian but at present weak in body." Whitefield preached several times for Edwards

during the next two days, and the Princeton president to be was completely overcome. On Sunday October 19 "good Mr. Edwards wept during the whole time of service." Whitefield declares that he "felt wonderful satisfaction in being" at Edwards' house. Leaving Northampton, Whitefield made his way back to New York, where he spent four days preaching for Dr. Pemberton, and then started for Philadelphia. On his way he stopped among other places at Newark to preach for Aaron Burr.* At Philadelphia he wrote to Governor Belcher recommending to him his friend Gilbert Tennent, who was going to Boston to carry on the work, and on November 17 he started for his parish at Savannah, where he arrived December 13 after an absence of over four months. It must be noted that all of Whitefield's tours were to the advantage of his charge in Georgia, for he never failed to bring back large contributions to the support of the Orphan House. For instance, the tour just completed netted the remarkable sum of over £700.

In January 1741 Whitefield sailed for England, remaining on that side of the water until August 1744. On October 26 he landed once more on American soil, this time at York, in Maine. Belcher was no longer governor, and the secret coldness that Whitefield had suspected when he met the Boston clergy at the Governor's table in 1740 had turned into enmity, and the next year he spent replying to libellous pamphlets and nursing his health. Strangely enough the opposition was headed by the authorities at Harvard and Yale, where he had preached with good results during his first visit to New England. His letters show that he kept in touch with the Tennents and his other friends in New York and Philadelphia; but nothing of present interest occurred until November 1746, when, in Virginia, he preached to the little Presbyterian congregation which Samuel Finley had visited in 1745, and whose pastor Samuel Davies became in 1747. It seems likely that he met Finley about this time. At any rate, in April, 1747, he met Davies, who had just been licensed to preach in four mission churches near Hanover.* He must have heard by this time of the foundation of the College of New Jersey, but I have been unable to find any contemporary reference he may have made to the institution. It is safe to say, however, that when he was in New York and vicinity in the fall of 1747, he took the opportunity to visit his friend Governor Belcher, then just entering on his new duties, for on October 2 Belcher wrote to a friend in England that when he was in New York he had heard Whitefield preach twice and had found him "the same seraphick creature he ever was."† To meet the Governor at this time was to talk of the new college, and when Whitefield sailed for the Bermudas in March 1748, and thence to England in June, he carried with him the resolution to do anything that lay in his power to hasten the realization of the old Governor's cherished plans. So we read in a letter written to his friend Ebenezer Pemberton on November 21, 1748, "I have been endeavoring in Scotland to do all the service I could to the Indian School and the New Jersey college whilst I was there; but I believe nothing will be done to purpose unless you or some other popular minister come over and make an application in person. In all probability a collection might then be recommended by the General Assembly, which sits next May, and large contributions be raised among private persons who wish well to Zion."‡ Governor Belcher had already that year been

*Stearns, 160.

*Whitefield 2.92 and Sprague, Annals of the Amer. Pulpit. N. Y. 1858. 3140.

†N. J. Hist. Soc. Coll., 5. 211.

‡Whitefield 2. 206.

writing to relatives in England about the college,* and seven months later, on July 10, 1749, Whitefield asks Pemberton, "Is there no prospect of your coming over? Your Mr. Tennent might do much for New Jersey college; but I have told you my mind in a former letter."† It remained for outsiders to do what the Trustees would not or could not do at that time.

In the minutes of the board of trustees, dated at New Brunswick September 27, 1749, occurs this memorandum: "Coll. Williams and Mr. Jeremiah Allen, designing to make a voyage to Great Britain and having offered their kind services in favour of the College, the trustees very thankfully accept them and desire these gentlemen to exert themselves in our favour assuring them that the Trustees will be very ready to make their acknowledgements proportionable to their success." Early in 1750 Col. Williams and Mr. Allen arrived in England with letters of introduction from Governor Belcher and Aaron Burr, now president of the college. Among these letters was one from Governor Belcher to the Countess of Huntingdon, who was the patroness of Whitefield. The latter immediately introduced the visitors to the Countess and to other influential friends. The Countess was interested at once. "A statement of the plan and enlargement of the College was drawn up and several of the dissenting ministers in London promised their assistance. By the advice of Lady Huntingdon their statement was printed together with a recommendation of the plan, subscribed by her ladyship, Dr. Doddridge, Mr. Whitefield and others. Being desirous of serving the interests of this rising institution . . . her ladyship was very active in collecting considerable sums amongst her friends and acquaintances, and corresponded with many persons of eminence in England and Scotland to whom she communicated the mission of Mr. Allen and Col. Williams. Mr. Whitefield likewise lost no opportunity of recommending the institution to the attention of those who he thought could effectually further the objects it had in view. He preached several sermons in its behalf; and in the course of a few months considerable sums were collected, which were immediately transmitted to America."* On April 27, 1750, Whitefield wrote to the Governor: "I am glad your Excellency hath been honoured by Providence to put New Jersey College on a footing that it may be a nursery for future labourers. I have had the pleasure of seeing Mr. Allen and Colonel Williams, and have introduced them to such of my friends as I believe under God may serve the interests in which they are engaged. . . . By the Divine blessing I hope that something considerable will be done in England and Scotland for New Jersey College."† To a friend he writes the next day: "There is a glorious plan set on foot by the great and good for a college in the New Jersies; the particulars will ere long be published. I wish it much prosperity."‡ The Rev. Mr. McCulloch of Cambuslang, Scotland, received the following from Whitefield dated May 14, 1750: "I have desired to write you a long letter for a considerable time but was so hurried when at London that I could not be so explicit as the affair I wanted to write about necessarily required. It is concerning the Presbyterian College in the New Jersies; the importance and

*N. J. Hist. Soc. Coll. 5. 235.
†Whitefield 2. 266.

*Life and Times of the Countess of Huntingdon. London 1840, 1. 140. These memoirs were compiled by a member of her family chiefly from private records which of course I have had no opportunity to examine. I believe, however, that no records exist here at least of any funds received from England directly through her.

†Whitefield 2. 344.
‡Ibid. 345.

extensive usefulness of which I suppose you have long since been apprized of. Mr. Allen, a friend of Governor Belcher, is come over with a commission to negotiate this matter; he hath brought with him a letter which Mr. Pemberton sent to you some months past. This letter hath been shown to Doctor Doddridge and several of the London ministers, who all approve of the thing and promise their assistance. Last week I preached at Northampton, and conversed with Doctor Doddridge concerning it. The scheme that was then judged most practicable was this: 'That Mr. Pemberton's letter should be printed and a recommendation of the affair subscribed by Doctor Doddridge and others be annexed; that a subscription and collections should be then set on foot in England and afterwards that Mr. Allen should go on to Scotland.' I think it is an affair that requires dispatch. Governor Belcher is old, but a most hearty man for promoting God's glory and the good of mankind. He looks upon the College as his own daughter and will do all he can to endow her with proper privileges. The present President, Mr. Burr, and most of the Trustees I am well acquainted with. They are friends to vital piety and I trust this work of the Lord will prosper in their hands. The spreading of the Gospel in Maryland and Virginia in a great measure depends upon it and therefore I wish them much success in the name of the Lord. But more of this when we meet."*

Meanwhile the trustees had received no reports of the work Messrs. Allen and Williams were doing in England, for in their minutes dated at Newark September 26, 1750, is the following: "There are as yet no accounts of the success of those gentlemen who offer'd us their good offices in Great Britain." A partial explanation is here given. "Unhappily for the scheme of the New Jersey College Mr. Allen who came over on purpose to negotiate it was smitten by the fatal infection which during the summer of this year was so prevalent at the Old Bailey, and died about two months after his arrival in England."† Whitefield, however, wrote on October 13, 1750, to Mr. T(ennent?) "I am glad that New Jersey College succeeds. I had lately a letter from Governor Belcher which I suppose you have seen. Colonel Williams proposes that Mr. Pemberton shall come over with one of the Indians; I wish he may."† And the same date to Governor Belcher: "I had the favour of your Excellency's letter and took the liberty of communicating it to the good Lady Huntingdon. . . Her Ladyship will be very glad to open a correspondence with your Excellency; and seems to speak of New Jersey College with great satisfaction. I rejoice to hear that it is in a prosperous situation. If Mr. Pemberton or Mr. Burr can be prevailed to come over I am persuaded liberal contributions will be raised both in England and Scotland. All was ready, if dear Mr. Allen had not been taken off by death."‡

Ebenezer Pemberton was chosen to go to Great Britain that autumn; but his congregation objected and he declined. Governor Belcher deplores this decision in a letter [January 18, 1751] to Colonel Brattle of Massachusetts, for he declares that friends in Scotland were expecting some representative of the College to visit them.§ To Whitefield, who evidently had not heard of Dr. Pemberton's proposed trip, and seems to have become impatient with what he doubtless considered lack of energy on the part of the trustees, Governor Belcher wrote on June 23, 1752: "And now, Sir, let me thank you once

*Whitefield 2. 349.

*Life and Times 1. 141.

†Whitefield 2. 383.

‡Whitefield 2. 384.

§N. J. Hist. Soc. Collections, 5, 285.

more for your kind and generous concern for the welfare of the infant College in this province, which I assure you creeps along with great difficulty. The Trustees chose Mr. Pemberton the last fall to take a voyage to Great Britain in favour of the College, but when the thing came before his church and congregation they would by no means be prevailed upon to let him go."* In his speech to the trustees at commencement, September, 1752, the governor referred to the lost opportunity; and Whitefield, replying in December to his letter, says: "I am sorry, very sorry, that not one of his [Christ's] ministers could venture over the Atlantick for New Jersey College. Two general collections have lately been made upon other occasions in Scotland. What a pity, when all circumstances concurred, that such a favourable opportunity should have been lost! I can only lament that which I did all I could to prevent."† He was soon gladdened, however, by the news that his old friend Gilbert Tennent was coming over with Samuel Davies. To a friend in America he writes in June 1753: "If they come with their old fire I trust they will be enabled to do wonders."‡ He mentions their intended trip in another letter some days later.§ On Christmas day, 1753, Tennent and Davies arrived in London. Whitefield immediately took up their cause, writing on December 27 to the Marquis of Lothian as follows: "A matter of some importance is the occasion of my troubling your Lordship with another letter. The reverend Mr. Gilbert Tennent of Philadelphia, and the reverend Mr. Davies from Virginia (both eminent ministers of Jesus Christ) are just arrived. They are commissioned to apply for a general collection in Scotland, and to procure private contributions for the building and maintaining a Presbyterian college in New Jersey province. What I therefore beg of your Lordship is that you would do them the honour of permitting them to wait upon you, and that they may be also introduced to Lord Leven. . . I shall wait for your Lordship's answer and then apprize them of it."* On the same day he wrote to his friend Dr. Gillies of Glasgow: "Perhaps it may please you to hear that Messrs. Tennent and Davies supped with me last night. . . I hope they will be introduced soon to the Marquis of Lothian and by him to Lord Leven. I shall help them all I can."† He invited them to make his house their headquarters, an invitation which in prudence they declined on account of Whitefield's uncertain position in the clerical world; but they visited him privately, says Mr. Davies in his journal, and "the kind reception he gave us revived dear Mr. Tennent." In a letter to Governor Belcher, January 11, 1754, Whitefield says: "Was Lady Huntingdon in town they [Tennent and Davies] should have been introduced before now, but at present she is at Bath drinking of the waters of life freely."‡ Two months later Whitefield was again on his way to America. The spring and early summer he spent in the south, but in July he travelled northward and on the 31st he preached at Newark. Without doubt he visited the college and his friend Aaron Burr, and he must have heard with no little joy that two days before his arrival ground had been broken at Princeton and the first corner-stone of a new and magnificent college building laid. His work for the college was not overlooked by the board of trustees. On the 30th of September he writes from Elizabeth to the Countess of Huntingdon: "I am now at Governor

*N. J. Archives, 1, 8., pt. 1, 85.
†Whitefield, 2. 462.
‡Whitefield 3. 16.
§Whitefield 3. 17.

*Whitefield 3. 54.
†Ibid. 55.
‡Ibid. 58.

Belcher's. . . Last week was the New Jersey Commencement, at which the President and Trustees were pleased to present me with the degree of A.M."* On this occasion he preached before the Synod. To Dr. Gillies he wrote a month later: "I was exceedingly delighted at New Jersey Commencement. Surely that college is of God. The worthy president, Mr. Burr, intends to correspond with you."† However pleased Whitefield was with the honor done him, he retained in all his publications until 1763 his Oxford bachelor's degree. In that year his friends in England, less modest than he, published without his knowledge a pamphlet on whose title page we read for the first time "George Whitefield, A.M."‡

In October 1754, President Burr accompanied Whitefield to Boston, spending a week with him there.§ That winter Whitefield went south, and in January 1755, while in Virginia, he preached for the Rev. John Todd, a graduate of the College [1749], who, beside his ministerial duties, managed a classical school, Among his pupils was a young Virginian, James Caldwell, who was studying to enter Princeton. Eight years later, when pastor of the Presbyterian church at Elizabeth, Caldwell had the pleasure of Mr. Whitefield's presence in his pulpit. Whitefield must have noticed with some degree of personal satisfaction the number of Princeton graduates he met among the younger generation of ministers outside of New England.

As early as 1750 Governor Belcher had written to friends in Great Britain about the possibility of having the degree of D.D. given to President Burr by some university abroad,‖ but without result. Whitefield on his return to England in 1755 gave the matter his attention. To the Marquis of Lothian, accordingly, he wrote on May 14, 1755: "Being but lately arrived in my native country I take the first opportunity of returning your Lordship thanks for your great zeal in promoting the welfare of New Jersey College. Surely it is the purest seminary that I have known. . . I think if the degree of Doctor of Divinity could be procured for Mr. Aaron Burr, their present worthy president, it would still make an addition to the honour of the College. He is a most excellent man; your Lordship will not be offended at my making the motion."* To Dr. Gillies, June 27, 1755, he wrote: "If you remember, I hinted to you something about getting a Doctor's degree for President Burr; since then I wrote to the Marquis of Lothian. His Lordship writes thus, 'The University of Edinburgh desire of me to obtain some account of Mr. Aaron Burr's literature or performances; this I hope you will do, and a diploma will be immediately transmitted.' By this post I shall write what I know of the President, but I would have you and Mr. E. — write also immediately to the Marquis. Surely he is the most worthy, ingenious, diligent and truly Christian President of his age, now in the world. He hath published something lately to animate our people against the common enemy. I have it at London, and hope you have it with you. If so, be pleased to transmit it to the Marquis. I shall mention it, and so do you to his Lordship."† The Marquis thus regarded Whitefield's suggestion favorably. Replying to him on June 27, 1755, Whitefield, after thanking him for his attention, proceeds: "Never was there a man in the world, that could be more safely recommended as a scholar and a truly Christian minister of the Gospel and a

*Whitefield 3. 103.
†Whitefield, 3. 110.
‡Tyerman 2. 335, 462.
§Philip, Life and Times of George Whitefield. 419.
‖N. J. Hist. Soc. Coll. 5. 265.

*Whitefield 3. 119.
†Whitefield 3. 125.

laborious, prudent President of a College than Mr. Aaron Burr. He was educated at Yale College in Connecticut, New England; and for his pregnant abilities and many years well approved piety was unanimously chosen to succeed the Reverend Mr. Dickinson in the care of New Jersey College. It would have delighted your Lordship to have seen how gloriously he filled the chair last year, at the New Jersey commencement. His Latin oration was beautifully eloquent, and was delivered with an unaffected, yet striking energy and pathos. As a preacher, disputant and head of a college he shines in North America; and the present prosperity of the New Jersey College is under God greatly owing to his learning, piety and conduct. The students revere and love him. Your Lordship might have testimonials enough from good Governor Belcher, Mr. Jonathan Edwards, *Cum multis aliis.* And I believe they would all concur in saying that of his age (now upwards of forty) there is not a more accomplished deserving President in the world. As for anything of his in print that can be referred to I cannot say, unless to a little pamphlet lately published in which he hath animated the people against the common enemy and discovered a close attachment to the interest of our rightful sovereign King George. . . . This piece of Mr. Burr's I have at London and I hope it is in Scotland. I just wrote to Mr. Gillies of Glasgow, who, together with Mr. T. E., I suppose will write to your Lordship concerning Mr. Burr. I wish the diploma may be transmitted against the next commencement. It will endear your Lordship more and more to the good people of America.* The pamphlet above referred to was "*A Fast sermon on account of the encroachment of the French*, . . . delivered at Newark January 1, 1755." It did not in itself prove a sufficient warrant for the degree, and the Edinburgh authorities suspended action until further information should be received concerning the New Jersey college president. To the latter Whitefield writes December 9, 1756: "I am sorry you have not your degree. It is ready if testimonials were sent from those who know you. This not being done, it looks as though the character given you on this side the water was not justly founded."* The next year Burr died from the effects of exposure at the funeral of Governor Belcher. Whitefield in a letter dated November 17, 1757, to a friend in America, refers to the death of his two friends as "dark providences,"† and in another letter to a gentleman connected with the college he adds: "I fear the death of the Governor and President will hurt New Jersey College."‡ His fears must have increased at the quickly succeeding news of President Edwards' death, although the only reference I have found in his letters is one made to Dr. Gillies of Glasgow, in August 1758, "I suppose you have heard of the death of Mr. Jonathan Edwards. Happy he!"§

July 1763 found Mr. Whitefield once more in his beloved America. In July he writes from Philadelphia: "I am here yet, left behind, and now about to make my first excursion to New Jersey College,"‖ referring of course to Nassau Hall, where he afterwards "had four sweet seasons." One of these "seasons" must have occurred when he preached to the students at five in the morning. It was on this visit that at President Finley's dinner table he made the prediction, "I shall die silent. It has pleased God to enable me to bear so many testimonials for Him during my life that He will re-

*Whitefield 3. 126.

*Whitefield 3. 195.
†Ibid. 3. 220.
‡Ibid. 3. 220.
§Ibid, 3. 239.
‖Whitefield, 3. 300.

quire none from me when I die." Later he writes: "New Jersey College is a blessed nursery: one of the purest perhaps in the Universe. The worthy President and three tutors are all bent upon making the students both saints and scholars. I was there lately for a week."* To Charles Wesley he wrote: "At New Jersey College we had sweet seasons among the sons of the prophets." Princeton undergraduates were not the only ones favored, however. Forgiving past scores Whitefield assisted in the renewal of Harvard's library which had been destroyed by fire, and at Yale the students were so impressed by his words that when he "was going off in the chaise, the President came to me and said . . that they were going into the chapel and earnestly entreated me to give them one more quarter of an hour's exhortation." Moreover, he preached that year at the commencement of the College of Philadelphia. On the way thither he attended the Princeton commencement, preaching before an audience which included the governor and trustees. The trustees passed a vote of thanks to him for his sermon and other great services to the college, and during his brief stay he was treated with well deserved honor. In July 1765 he returned to England, and four years elapsed before he set foot again in America. While in England he addressed a memorial to the King in which he prayed that his Orphan House in Georgia might receive a charter "upon the plan of the New Jersey College." In November 1769 he landed at Savannah on his last visit to America. Spending the rest of the winter and the ensuing spring in the south, he came to Philadelphia in May, going on to Albany the next month to attend an Indian congress with Mr. Samuel Kirkland, a young Princeton graduate (1765). Two months of exhausting itinerant work followed. Whitefield seemed to feel that it was his last opportunity, and was rebuked by William Tennent for the joy he expressed at his approaching end. On September 30 at Newburyport he died. Among the many sermons preached on his death was one by his friend of thirty years' standing, the Princeton ex-trustee, Dr. Ebenezer Pemberton.*

† Ibid. 3. 304.

* "Heaven the Residence of Saints." Boston, 1771.

THE SEMINARY COMMENCEMENT.

The annual sermon before the Board of Directors of Princeton Seminary was preached in the Miller Chapel on Sunday, May 2, by the Rev. Joseph T. Smith, D.D., LL.D., of Baltimore. The exercises of the eighty-fifth commencement were held in the same place on the following Tuesday, beginning at 10 A M. The Rev. Dr. Cattell, Vice-President of the Board of Directors, presided in the absence, on account of feeble health, of the Rev. Dr. Gosman. The chapel, all too small for such occasions, was crowded with the large graduating class and their assembled friends. Prayer was offered by the Rev. R. R. Booth, D.D., LL.D., of New York City, and the address to the class was delivered by the Rev. Howard Duffield, D.D., of the same city. The Rev. W. E. Schenck, D.D., having resigned the office of Secretary of the Board of Directors, an office which he had held for the last twenty-seven years, the official announcements were made by his successor, the Rev. Maitland Alexander, of New York City. The following fellowships and prizes were announced: The George S. Green Hebrew fellowship, awarded to Kerr D. Macmillan, of Mount Forest, Ontario; the Alumni New Testament fellowship and Robertson scholarship, to Thomas C. Laughlin, of Barnesville, O., a graduate of Princeton University; the Carter prize in Old Testament

study, to Charles F. Morrison, of Ambala, India, a graduate of Princeton University; the first Scribner prize in New Testament study, to Harry S. Ecker, of New Windsor, Md.; the second Scribner prize, to Chas. E. Gubler, of Evansville, Ind.; the Stanton prize in Old Testament study, to Seldon L. Haynes, of the middle class, of South McAlester, I. T., a graduate of Princeton University; the first Maitland prize in New Testament study, to Henry M. Bruins, of the middle class, of Alto, Wis.; the second Maitland prize, to Walter E. Smith, of the same class, of Philadelphia. Nine of the students had fulfilled the new requirements for the degree of bachelor of divinity. Diplomas were then conferred on sixty-five members of the graduating class, and they were addressed by Professor Paxton on behalf of the Faculty. After the singing of the class hymn the benediction was pronounced by Professor Green.

After a short recess the Alumni Association was called to order by its President, the Rev. John Fox, D.D., of Brooklyn. The event of special interest in connection with the business part of the proceedings was the declination of the Rev. Dr. Schenck to a reëlection to the office of one of the Secretaries of the Association, an office held by him since the founding of the Association in 1872. A resolution expressive of the appreciation of his services by the Association was passed, and he was made Honorary Secretary. The Necrological Report announced the death during the year of thirty-four former students of the Seminary and of the Hon. John Scott, LL.D., of Philadelphia, who was both a Director and Trustee, and of the Rev. James T. Leftwich, D.D., formerly of Baltimore, a Director for many years.

By the arrangement of the Executive Committee of the Association there was an informal but highly interesting celebration of the 250th anniversary of the completion of the Westminster standards. Three addresses were delivered as follows: "The Westminster Assembly: its Membership and Work," by the Rev. Wallace Radcliffe, D.D., of Washington, D. C.; "The Westminster Standards: their Place in the Development of Reformed Thought," by the Rev. Daniel S. Gregory, D.D., LL.D., of New York City, and "The Westminster Theology: its Moulding Power Over Men and Nations," by the Rev. James D. Moffat, D.D., President of Washington and Jefferson College. The addresses were all of a very high order, and merited and received the hearty thanks of the Association.

The alumni dined together in Stuart Hall, and after-dinner speeches were made by President Moffat, President Patton, the Rev. James Y. Mitchell, D.D., of Lancaster, Pa., representing the class of '57; the Rev. R. P. H. Vail, D.D., of Stamford, Conn., the class of '67, and the Rev. Arthur H. Allen, of Troy, N. Y., the class of '77.

The Directors at their meeting on Monday elected two new members of the Board: the Rev. Jere Witherspoon, D.D., of Baltimore, to succeed the late Rev. Dr. Leftwich, and Col. John J. McCook, LL.D., of New York City, to fill the vacancy caused by the death of the Hon. John Scott.

The Board of Trustees met on Wednesday and received the resignation of Dr. Samuel H. Pennington, of Newark, N. J., as President of the Board. Dr. Pennington has been a member of the Board since 1856, and its President since 1877. Charles E. Green, LL.D., was elected President in his place.

SUMMARIES OF PAPERS PUBLISHED.

REPORT OF EXPERIMENTS ON THE REDUCTION OF THE TACTUAL DOUBLE-POINT THRESHOLD BY PRACTICE, AND ON THE 'VEXIR-FEHLER (DOUBLE-POINT ILLUSION.)

By G. A. TAWNEY.

The first object of these experiments was to examine the view of Volkmann and Fechner* that, by daily practicing some one spot of skin in the perception of two points, the threshold for such perception will be reduced, not only for the spot actually perceived, but also for the symmetrically opposite spot on the other side of the body. The experiments of Volkmann and Fechner were repeated and their results corroborated by Dresslar in America.† It was observed, however, that these experiments were not planned to investigate the question whether this reduction as a result of practicing one spot occurs over the entire surface of the body. Should this prove to be true, the conclusion of Volkmann that the reduction is due to a change in the physiological structure of the sensory nerve-centres involved, as well as the conclusion of Dresslar that it is due to some modification of function in the peripheral organs, would need modification.

A number of thresholds, varying from 6 to 32, were determined on different parts of the bodies of eight subjects: one of these spots on each subject was chosen for special daily practice for a period varying from two weeks to a month. At the end of this time the threshold-determinations on different parts of the body were repeated, in order to compare them with those made at the beginning of the practice series. The subjects may be divided into three groups according to the results, viz., (1) those who gave, at the start, high thresholds (thresholds corresponding approximately to those given in Weber's table), and who showed at the end of the practice series generally reduced thresholds varying from one-half to one-tenth of the originals; *e. g.*, a threshold of 66 mm on the thigh was in one case reduced to 6 mm by a two-weeks daily practice series on the fore-arm. Among this group there were at the start no Vexirfehler whatever, *i. e.*, a single point was always recognized as one; but at the end of the series Vexirfehler occurred over the entire body, and on some days very frequently. (2) Those who gave low thresholds at the start, along with many Vexirfehler, and who, at the end of the series, showed thresholds somewhat (though only slightly) reduced over the entire body. One of these subjects developed the double-point illusion so strongly, as one result of the practice, that the second series of thresholds could not be determined. He answered "zwei Spitze" to every stimulus, whether from one point or from two. (3) Those who from the start made so many Vexirfehler that no certain thresholds could be determined. If they did not always answer "two points," they did it so often that it was impossible to tell what their thresholds were. One of these subjects, it is interesting to note, was Dr. Kiesow, who was at that time one of the assistants in the Leipzig Laboratory.

The first group were numerous enough to show that the sympathetic reduction of the threshold which Volkmann and Fechner first observed, occurs, not only on the spot directly opposite the one exercised, but over the entire body. On one of these subjects, whose case may be

*Ueber den Einfluss der Einuebung auf das Erkennen räumlicher Distanzen," Berichte der sächsichen Gesellsch. d. Wissensch. Bd. X (1858) math. phys. Abth. S. 38 ff.

† *Amer. Jour. of Psych.* Vol. VI, pp. 324-332.

taken as typical of the group, 32 determinations were made at the start on 32 different localities, and repeated at the close of the practice series. A pronounced reduction resulted on all of the spots save one, viz., the left cheek below the eye. The spots were chosen (1) with reference to their distance from joints, (2) with reference to the length of the radius of the circle through which the spot passes when the limb swings freely in a circle (this was done in order to discover any possible relation between the results of practice and the well-known generalization of Vierordt), (3) with reference to the nature of the substance underlying the skin, as, *e. g.*, bone, muscle, fat, etc., and (4) with reference to the location of the spots inside or outside of the limb; the purpose was to discover any possible relation between the degree of reduction and any or all of these conditions. But no such relation was to be seen in the results. The degree of reduction varies for different spots on the same individual, the resulting thresholds being in one case anywhere from one-half to one-tenth of the originals. The reduction is different on the same spot for different individuals. No special connection seemed to exist between the external conditions of the experiments and the reduction of the threshold. On the other hand, the fact that the results of the practice are general, points clearly to a central explanation of the whole phenomenon.

The experiments thus briefly described were so arranged that all the objective conditions of the phenomenon, which had not already received careful attention from others, were either varied or eliminated in succession. As the reduction appeared without alteration in every case, the thought suggested itself that the explanation should be sought among the subjective conditions. One of the subjective conditions is the information of the subject in regard to the problem, and the methods employed in approaching it. Subjects were sought who not only were not familiar with the experiments, but who knew nothing definite as to the literature of the subject. It was suggested by Prof. Wundt that possibly the Vexirfehler or double-point illusion, which had proven the greatest foe to these experiments, might not show itself in subjects who knew nothing in regard to the illusion or the experiments. In conducting the following experiments the subject passed his arm through a screen and was asked to say, simply, what touched him.

One of these cases, that of Mr. Franz, of Columbia College, is in most respects typical of all. Without using a single point at all at first, the series began with a distance of 5 mm between the points, ascending by gradations of 2 mm. The spot was on the volar side of the left forearm. Mr. Franz answered from the first, "a line," continuing to give this answer when the points of the compass were 80 mm apart. It was impossible to go beyond this distance without making the points stand obliquely on the arm. This series was repeated several times on different days without change. Mr. F. was then informed that he would not be touched with a line further, but with either one or two points. The instrument was exhibited to him. As a result, he gave a constant threshold on his lower arm of about 40 mm; it remained the same for over two weeks, a period which, with other subjects, had sufficed to reduce the threshold to from one-fifth to four-fifths of the original. It was then suggested to Mr. F. that he seek to make the threshold as small as possible in order to determine what reduction would occur as a result of practice. As a result, the threshold was reduced, *in two sittings* of one hour each, to about 16 mm, or about one-third of the original. The same experiments were re-

peated with Herrn Mosch with similar results; a complete carrying out was prevented in his case, however, by his failure to receive the suggestion that we should test the effect of practice. He asked, "Why have not all of our experiments been tests of the result of practice?" He, however, tried voluntarily to feel the two points at a shorter distance than usual, and, while not showing any marked reduction of the threshold on the whole, he yet began making the only Vexirfehler which appeared in his series; this result was common to the series with Mr. F. It seems clear from these cases that where no suggestion is present no reduction of the threshold occurs.

A final set of experiments was undertaken for the purpose of freeing a subject who continually made Vexirfehler from the suggestion involved. Dr. Mentz, who has taken Dr. Kiesow's place in the Leipzig Institute, made at first so many mistakes that his threshold could not be determined. Assuming that this resulted from suggestion, I first told him that I had met with two classes of Versuchspersonen, the members of one of them making no Vexirfehler, while the others did. I told him in particular of the experiments with Mr. F. and with Herrn Mosch. It was explained to him that the differences in the results seemed to be due to differences in the psychoses of the subjects. Dr. Mentz had frequently observed that his attention was directed subjectively to the sensation, for the purpose of analytically detecting any qualitative differences in its content; that an appreciable period always lapsed between the sensation and his judgment, and that the communication of his sensation in words involved a visual image of the arm, the points touched, the instrument, etc. It was suggested to him that Herr Mosch's attention seemed to be purely objective, being directed, from the first, to the instrument and the arm, and not to the sensation; that his answers were spontaneous and without any appreciable interval between the sensation and the answer, and that the perception of the stimulated points did not seem to involve in his case any analytical process. Dr. Mentz entered into the experiment with interest, and, after some random efforts, consisting of hasty guesses rather than perceptions, gave a constant threshold of about 33 mm, this threshold remaining until the end of the series, three days later.

Looking at these results together, it seems clear that the enormous reduction of the threshold by practice is due in great part to suggestion of some kind or other. Again, the perception of two points does not seem to be a synthesis or synthetic process based upon an analysis of the touch-sensations. It is rather what Wundt calls a complication and assimilation-product of association, into which tactual, visual and motor elements enter. The difference between the perception of two points in these experiments and that of normal experience lies simply in this, that the usual visual or motor presentation which accompanies the tactual sensation, is supplanted by a visual or motor image. The tactual "local sign" is not a simple quality of the sensation of touch, but rather a relation of association between tactual and visual or between tactual and motor experiences. The regularity of the reduction of the threshold which appears to result from practice, is from this point of view simply the process by which the suggestion gets itself established, and when finally effective its result is the double-point illusion or Vexirfehler. A number of series of experiments which cannot be described here were carried out to determine how far the double-point illusion can be influenced by suggestion, the result going to show that it is almost if not entirely due to autosuggestion.

This conclusion is really not new, for although Camerer regards the illusion as the result of imagination (Einbildungskraft), nevertheless his description of the psychosis involved is a description of what we understand to-day by suggestion. This seems also to be the truth of Dr. Nichols' view that the illusion is a product of the imagination. This view is especially opposed to the physiological explanation of G. E. Müller, Wundt and others.

Beloit College.

[The full article is in the current volume of Wundt's "Philosophische Studien." Bd. XIII, pp. 163–221.]

ORGANIC SELECTION.

By J. MARK BALDWIN.

In certain recent publications* an hypothesis has been presented which seems in some degree to meditate between the two rival theories of heredity. The point of view taken in these publications is briefly this: Assuming the operation of natural selection as currently held, and assuming also that individual organisms through adaptation acquire modifications or new characters, then the latter will exercise a directive influence on the former quite independently of any direct inheritance of acquired characters. For organisms which survive through adaptive modification will hand on to the next generation any "coincident variations" (*i. e.*, congenital variations in the same direction as adaptive modifications) which they may chance to have, and also allow further variations in the same direction. In any given series of generations, the individuals of which survive through their susceptibility to modification, there will be a gradual and cumulative development of coincident variations under the action of natural selection. The adaptive modification acts, in short, as a screen to perpetuate and develop congenital variations and correlated groups of them. Time is thus given to the species to develop by coincident variation characters indistinguishable from those which were due to acquired modification, and the evolution of the race will proceed in the lines marked out by private and individual adaptations. It will appear as if the modifications were directly inherited, whereas in reality they have acted as the fostering nurses of congenital variations. This principle is called *Organic Selection.*

It follows also that the likelihood of the occurrence of coincident variations will be greatly increased with each generation, under this "screening" influence of modification; for the mean of the congenital variations will be shifted in the direction of the adaptive modification, seeing that under the operation of natural selection upon each preceding generation variations which are not coincident are more and more eliminated.*

Furthermore, it has recently been shown that, independently of physical heredity, there is among the animals a process by which there is secured a continuity of social environment, so that these organisms which are born into a social community, such as the animal family, accommodate themselves to the ways and habits of that community. Professor

*H. F. Osborn, Proc. N. Y. Acad of Sci., meeting of March 9 and April 13, 1896. C. Lloyd Morgan, "Habit and Instinct," October, 1896, pp. 307 ff. J. Mark Baldwin, discussion before N. Y. Acad. of Sci., meeting of January 31, reported in full in *Science* March 20, 1896, also *Amer. Naturalist*, June and July, 1896. The following brief statement has been prepared in consultation with Principal Morgan and Professor Osborn. I may express indebtedness to both of them for certain suggestions which they allow me to use and which I incorporate verbally in the text. Among them is the suggestion that "Organic Selection" should be the title of this paper. While feeling that this coöperation gives greater weight to the communication, at the same time I am alone responsible for the publication of it.

*This aspect of the subject has been especially emphasized in my own exposition, *American Naturalist*, June, 1896, pp. 147 ff.

Lloyd Morgan,* following Weismann and Hudson, has employed the term "tradition" for the handing on of that which has been acquired by preceding generations; and I have used the phrase "social heredity" for the accommodation of the individuals of each generation to the social environment, whereby the continuity of tradition is secured.†

It appears desirable that some definite scheme of terminology should be suggested to facilitate the discussion of these problems of organic and mental evolution; and I therefore venture to submit the following:—

1. *Variation:* to be restricted to "blastogenic" or congenital variation.

2. *Accommodation:* functional adaptation of the individual organism to its environment. This term is widely used in this sense by psychologists, and in an analogous sense by physiologists.‡

3. *Modification* (Lloyd Morgan): change of structure or function due to accommodation. To embrace "ontogenic variations" (Osborn), *i. e.*, changes arising from all causes during ontogeny.

4. *Coincident Variations* (Lloyd Morgan): variations which coincide with or are similar in direction to modifications.

5. *Organic Selection* (Baldwin): the perpetuation and development of (congenital) coincident variations in consequence of accommodation.

6. *Orthoplasy* (Baldwin): the directive or determining influence of organic selection in evolution. §

7. *Orthoplastic influences* (Baldwin): all agencies of accommodation (*e. g.*, organic plasticity, imitation, intelligence, etc.), considered as directing the course of evolution through organic selection.

8. *Tradition* (Lloyd Morgan): the handing on from generation to generation (independently of physical heredity) of acquired habits.

9. *Social Heredity* (Baldwin): the process by which the individuals of each generation acquire the matter of tradition and grow into the habits and usages of their kind.*

[Reprinted from *Biologische Centralblatt* and *Science*, April 23, 1 97]

A NEW METHOD OF DETERMINING THE SPECIFIC HEAT OF LIQUIDS.

By ROBERT L. LITCH.

This article is to outline a new method for determining the specific heats of liquids. The methods previously employed have the disadvantage of not being "null methods," and have therefore required corrections of a very serious character. The method proposed in this paper has for its basis two special features, (1) the use of the electric current for the generation of heat, (2) the maintaining the calorimeter cup at a constant temperature during the experiment. By this second feature all corrections for "water equivalent" and "radiation" are eliminated.

I.—THEORY OF THE METHOD.

Into two vessels the liquid, whose spe-

*"Introduction to Comp. Psych.," pp. 170, 210 "Habit and Instinct," pp. 183, 342.

†"Mental Development in the Child and the Race," 1st ed., January, 1895, p. 364, *Science*, August 23, 1895.

‡ Professor Osborn suggests that "individual adaptation" suffices for this; but that phrase does not mark well the distinction between "accommodation" and "modification." Adaptation is used currently in a loose general sense.

§ Eimer's "orthogenesis" might be adopted were it possible to free it from association with his hypotheses of "orthogenic" or "determinate" variation and use-inheritance. The view which I wish to characterize is in some degree a substitute for these hypotheses.

* Professor Lloyd Morgan thinks this term unnecessary. It has the advantage, however, of falling in with the popular use of the phrases "social heritage" and "social inheritance." On the other hand, "tradition" seems quite inadequate; as generally used it signifies that which is handed on, the material; while in the case of animals we have to deal mainly with the process of acquisition. "Social heredity" also calls attention to the linking of one generation to another. However, I think there is room for both terms. For further justification of the term "Social Heredity" and "Organic Selection," I may refer to the *American Naturalist*, July, 1896, pp. 552 ff.

cific heat is desired, is placed. These vessels are so arranged, one above the other, that liquid can be easily dropped from the upper into the lower. The temperature of the liquid in the upper is as near 0 °C as possible, while that of the lower is at room temperature.

A coil of wire is placed in the lower vessel, through which the current is allowed to flow, and the heat thus generated is neutralized by dropping a sufficient quantity of liquid from the upper vessel.

Then

$$H = s\, m\, (T - T_0)$$

where H = number of calories, s^1 the specific heat, m^2 the mass of liquid dropped, T the room temperature, and T_0 the temperature of liquid dropped. Substituting this in the expression for Joule's law

$$(1)\quad s^1 = \frac{r\, c^2\, t}{J\, m\, (T - T_0)}$$

where the letters in the numerator have their usual significance and J is the mechanical equivalent of heat.

If we use two such calorimeters, containing different liquids, with their coils joined in series, we have the relation

$$(2)\quad \frac{s^1}{s^2} = \frac{r_1\, m_2\, (T - T_{02})}{r_2\, m_1\, (T - T_{01})}$$

where the subscripts refer to the two calorimeters respectively.

II.—APPARATUS.

The apparatus used is a modification of the "Waterman Calorimeter." The calorimeter cup is made of very thin glass instead of silver. It passes through a rubber cork and with it completely closes the mouth of the air thermometer. Inside the cup is a coil of platinum wire, whose ends pierce the sides, are soldered to large copper "leads," which run up along the sides of the cup and through the cork, and thus are brought into connection with the current supply.

The other pieces of apparatus used have been:

(*a*) Two thermometers, one graduated to $\frac{1}{20}$ degrees for measuring the temperature of the cooler liquid, the other graduated to $\frac{1}{5}$ degrees for measuring room temperature;

(*b*) A copper voltameter;

(*c*) Galvanometer;

(*d*) Storage battery;

(*e*) Balance.

III.—PRACTICE OF THE METHOD.

The operations required are measurements of current, mass of liquid dropped, time, resistance of the calorimeter coil, temperature of the cooler liquid and the room.

Of these operations but two, measurements of time and resistance, need any comment.

For the first of these I have used an ordinary watch. This has been allowable because the current used has been small, and hence the time of experiment quite long. The result is that, the total number of seconds being large, an error of one second introduces no change in the results. Even an error as small as this can be avoided by a properly chosen key for turning the current on or off.

In regard to the measurement of the resistance of the coil it is to be noted that this must be done during the experiment. It is not sufficient to know its resistance at zero as well as its temperature coefficient, for then the temperature of the liquid must be taken as that of the coil, an assumption clearly erroneous since it is known that heat passes from the coil to the liquid. Inasmuch as it is impossible to determine the exact temperature of the coil it is necessary to choose some method which will determine the resistance whatever the temperature may be. For this reason I have employed the Fall of Potential method. This is both easy of application and, for the small resistance used, of great accuracy. German silver wire,

No. 16, B. W. G., was taken as the coil of known resistance.

IV.—RESULTS.

At this time I am able to give results on but one substance, viz. water.

T	s
18.8°	.98075
19.71	.98064
21.05	.98035
21.2	.98035

These results lie between those given by Dieterici and Velten for 20°, the former's value being .9893, the latter's .9794. They agree well with one another and follow the law, announced by Rowland, that the specific heat of water diminishes between 4° and 30°.

V.—SECOND METHOD.

A glance at equation (*II*) shows that by its use it is not necessary to take into account either current, time or mechanical equivalent.

The equation is independent of current because the two calorimeter coils are joined in series, and hence the current in one is the same as in the other *at every instant*, whatever the fluctuations may be. Hence the ratio of $c^2 : c^2$ is unity.

The equation is independent of time since the duration is the same for both calorimeters, and independent of mechanical equivalent, since both calorimeters are worked at the same temperature.

Another advantage, not immediately on the surface, is afforded by this method. The current as given by the voltameter is the *average* current. If, as is necessary in the first method, this value is used, since it must be squared when set into the formula a value $\left[\frac{1}{t}\Sigma c\right]^2$ is derived instead of the desired expression $\frac{1}{t}\Sigma c^2$. The first value may be taken as equal to the second only when the variations in the current are small. But, it being impossible to ensure this, to assume that the "square of the mean may be equated to the mean of the square" is to involve in any results thereby obtained an error of indeterminate magnitude.

No results are given for this second method, since up to the present time I have been unable to try it. Theoretically it stands in a much more favorable light than the first. At a later date I shall attempt to demonstrate this experimentally.

[Abstract from *Physical Review.*]

ON A NEW INTERESTING AMERICAN FOSSIL.

By ARNOLD E. ORTMANN.

(PRELIMINARY REPORT.)

The Geological Museum has lately acquired two unique specimens of a fossil Crustacean, which is not only interesting because it is the first form of the Decapod family Palinuridæ which has been found in America, but because it is so completely preserved that its exact systematic position may be made out. In Europe many fossil forms of this group have been discovered, but their preservation is more or less incomplete, so that only their general position with the recent family Palinuridæ could be ascertained, and, accordingly, for most of them new generic names have been created, the relation of which to the recent genera is wholly obscure.

In the new American fossil, which comes from the Upper Cretaceous deposits (Fox Hills group) of head of Cottonwood creek, Mead county, South Dakota, most of the generic characters are well exhibited, so as to enable us to compare it with the recent genera; and, indeed, after a careful examination I have found that it is cogeneric with a species living nowadays in the seas of Japan, the name of which is Linuparus trigonus. There are

so many peculiar relations to this Japanese species, that I do not hesitate to place our fossil in the same genus, and I propose to call it *Linuparus atavus*. On the other hand, there are a few characters which constitute some kind of transition between the living genus *Linuparus* and the living typical genus of the family, *Palinurus*, so as to render this fossil the more interesting.

The fact that this fossil form has been found in America gives us an important suggestion as to the origin of the geographic distribution of the genus *Linuparus*. Linuparus is *not* an "autochthont" form of the Japanese seas, the Japanese seas are not the "centre of origin" of this genus (as might be supposed from the present exclusive distribution in these seas), but in former times this genus was distributed probably all over the world, and the living Japanese species is the only "relict" left of their former more universal distribution.

[A more detailed description of this form is about to be published in the *American Journal of Science*.]

REVIEWS OF BOOKS.

"La Pierre de Touche," by Émile Augier, with introduction and notes by George M. Harper, Ph D., Professor of Romance Languages in Princeton University. Ginn & Co., 1897.

In spite of the fact that we have on the market so many French texts prepared for class-room use, and especially so many modern texts whose principal value is a passing interest, there are not many that would not be driven out by such changes in literary taste as have marked the latter half of this century. The texts that continue to be studied are precisely those whose interest is based upon a study of human character or upon the philosophy of social customs, and not upon the excitement of the plot or the complexity of the intrigue. The latter depend partly upon each generation's peculiar interest, but there is always something new in the study of characters as clearly portrayed as are those in Augier's "Pierre de Touche." Augier peoples his plays with real personages. Spiegel, in "La Pierre de Touche" is a person we should like to meet, and from whose acquaintance we might profit. We can trust that he, and the other characters in the play as well, will be true to themselves to the end. The plot depends upon them; they are not its mere tools. No other of Augier's plays written in his second style equals his "Pierre de Touche," and, though it was rivaled by "Le Gendre de M. Poirier" in after years when Augier took up the *comédies de mœurs*, perhaps no other of his plays will give the reader a better idea of Augier's true strength, for the very reason that this was the period when he gave most attention to the portrayal of character. The force and moral soundness so characteristic of Augier were probably refined and softened by the weaker but more finished Sandeau, with whom the "Pierre de Touche," as well as the "Gendre de M. Poirier" was written. And though, as Professor Harper suggests, we cannot tell how much is really due to Sandeau, it does seem safe to say that it was a happy collaboration that could produce two of the best plays bearing Augier's name. We might wish that more of the introduction had been devoted to Sandeau's probable influence, particularly in "La Pierre de Touche." Otherwise Professor Harper accomplishes, in his usual bright and attractive style, what seems to me to be the main object in an introduc-

tion to a text, and that is, not to give a dry biography such as can be found in any encyclopedia, but to put the student in a position to appreciate as thoroughly as possible the text he is about to read. We welcome this attractive acquisition to our French texts all the more heartily because we feel that time will respect this new friend as it has respected the plays of Molière and of Beaumarchais.

W. U. Vreeland.

Elements of Theoretical Physics. By Dr. C. Christiansen, Professor of Physics in the University of Copenhagen. Translated into English by W. F. Magie, Ph.D., Professor of Physics in Princeton University. Macmillan & Company.

It is the object of this treatise to present the fundamental principles of all the main departments of Theoretical Physics from a modern standpoint and within the limits of a single volume. Students have long felt the need of an introduction to Mathematical Physics, not too long nor too difficult, to be read in the last years of an undergraduate course and before undertaking the detailed study of some particular branch of the subject; and that need is here met with remarkable success. By carefully selecting his material and restricting his discussion to topics of the first importance, the author has found space for a substantial treatment of these topics, and has avoided the sketchiness which renders many brief treatises of wide scope practically valueless.

He considers in order the General Theory of Motion, Elasticity, the Equilibrium and Motion of Fluids, Natural Friction, Capillarity, Electro-statics, Magnetism, Electro-magnetism, Induction, Electrical Oscillations, Refraction of Light in Isotropic and Transparent Bodies, Thermodynamics and Conduction of Heat; not only presenting the discussions which have come to be regarded as classical, but introducing the new work of importance also. There is some variety in the mathematical treatment without the variety of notation which bewilders the student who must get his mathematical physics from a number of different sources. Altogether, this book supplies a means of obtaining a connected and consistent impression of modern theoretical physics with as little unnecessary effort and as little encounter with mathematics of serious difficulty as is, perhaps, in the nature of the case possible.

F. A. Waterman.

Elementary Text Book of Physics. By Professor Wm. A. Anthony and Professor Cyrus F. Brackett. Revised by Professor William F. Magie. John Wiley & Sons, New York, 1897.

This text book is a revision of the eighth edition of the work which has been in use for the past ten years. The reviser has adhered to the original design of the authors in presenting the fundamental principles of physics, with brief statement of their experimental verification. The omission of pictorial representation and detailed descriptions of apparatus renders necessary a full and thorough lecture course, supplementing the text by qualitative experiments and demonstrations. By the omission of such descriptive matter the authors have been able to present concisely the elements of physics without unduly increasing the size of the work. The principal changes which have been made in the revision are the omission of several demonstrations which were not of sufficient importance to be included in a work of this character; a rearrangement and enlargement of the mechanics; the addition of a discussion of the kinetic theory of matter and of a treatment of magnetism and electricity by the method of tubes of force, and the introduction of discussions of hysteresis and of the Röntgen radiance. The Mechanics has

been put into a more satisfactory form and presented in a more logical order, the treatment of the subject of flux of force, introduced after the general treatment of potential, furnishing a suitable preparation for the treatment of magnetism and electricity by the method of tubes of force. Sound has been brought forward in this edition, and is now treated before Heat and immediately after Mechanics, thus placing these subjects in the order naturally suggested by their character. Many minor changes have been made throughout the work, embodying the corrections of previous editions and also the rewriting of paragraphs as suggested by the class-room use of previous editions.

The publishers have issued the work in a volume much more handy than the past editions, while retaining clearness of page and legible print.

F. A. Waterman.

An Introduction to Geology. By W. B. Scott, Blair Professor of Geology and Palaeontology in Princeton University, XXVII–573, XII plates and 169 illustrations. New York: The Macmillan Company, 1897.

With the ever-increasing amount of knowledge in most scientific fields there has been a greater demand for such books as this, giving concise and ample guidance for the study of specific problems as they are exemplified in one's own country. Not that the broader subject is neglected, but that the matter is presented from the "home" aspect. In the class-room such a presentation of the facts of a science is sure to meet with a more cordial reception, because of the practical applications which can be made. It serves to meet the everlasting Why? of the inquiring mind when confronted by some interesting but at the same time puzzling natural phenomenon.

There is one feature of the book which cannot be too highly praised, and that is the many instances in which conflicting theories are impartially stated and the reader forced to weigh the evidence for himself, perhaps thereby to receive the incentive for investigation on his own account. This might almost be said to be the most gratifying result which any author could desire, particularly if he happens to be a teacher. The inspiration thus gained becomes the most fruitful source of future success, because of the many open questions which are still awaiting solution. Sometimes this hospitality to new suggestions may be carried too far, however. In the volume under consideration this is done with great caution. Instances might be given where apparent exceptions to general laws have found their way into text-books, in such shape as to lead one to infer that they were the important features after all, whereas a more careful study of the phenomena might reveal the fact that it conformed to the laws in every essential particular. An instance in point might be given, as based upon the explanation of the Figure, on page 39. It might almost appear that a new theory of volcanic activity had been proposed, namely, that the central portion of the mountain had been fused and had then dropped into the channels below. The theory does not seem necessary because of the similar character of the activity of Kilauea, at the present time, and a modified form of the same thing on a much more extended scale in the extinct crater of Haleakala. The latter is probably a better example because of many points of similarity, even if in one case the bed of the crater is filled with a body of water, and in the other there is a lava floor formed by the flow of lava through the two enormous gaps produced by the splitting of the mountain. A comparison with Kilauea might, however, be based upon similar con-

ditions, although Kilauea is active and shows the type of activity which probably existed in the west at the time when Crater Lake was formed.

This book brings up once more the question of the order of the subject-matter and their inter-relations; and it almost makes one wish that the time was ripe for a new subdivision of the department which would give Dynamical Geology and all its physical problems a full and more comprehensive treatment. Observational methods have added so much that is largely physical to our knowledge of the subject that it is a pity that the geologist should not have the benefit of these new facts.

Another feature of the book, in addition to its American "sources," is found in the pages devoted to Physiographical Geology, where a summary of the valuable conclusions reached during recent years makes the scattered literature very accessible. The illustrations are, in the main, also from our continent, and are thus a welcome addition to the available series of pictures of geological phenomena.

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SELECTIONS FROM PIERRE LOTI. Edited with Introduction, Notes and Bibliography, by A. Guyot Cameron, Ph.D., Assistant Professor of French in the Sheffield Scientific School of Yale University.

Sometimes we feel that it is not advisable to devote to a single book all the time that would be necessary for a careful class-room study of the entire text, unless it is comprehensively characteristic of the author or has some exceptional objective value, and consequently we often wish for an abridgment even of what is best in the best of a writer's complete works. No one will claim that Pierre Loti is always at his best even in his best book and no one will deny him pages of genius in his poorest story. For, although "Mon frère Ives" and the "Pêcheur d' Islande" are generally considered his masterpieces, they do not represent the whole man. At the same time the heroes in his books do not suffer as much in abridgment as would the more intellectual characters of many psychological novelists. Loti's characters are a part of the immensity, the sublimity, the vastness of nature. They seem even to have less personality than nature itself. They overflow with life and animal spirits, but are lacking in intellectuality and the refinement of culture. Consequently they are less varied and more easily understood than complicated characters are. I say this in justification of the extreme cutting down of the stories which Prof. Cameron has edited, if any justification is needed. He has reduced the novels of Loti almost to short stories and yet they do not lose their individuality. He has happily retained many of those vivid descriptions, so simple and yet so true, so plain and and at the same time so inspiring because they are stamped with all the sincerity of a sympathetic impressionist, and those descriptions are among Loti's principal charms.

In the introduction Prof. Cameron seems to have felt to the full extent the poetic harmony and the almost mystic and superstitious cult of the infinity of nature which makes Loti's books "unique," as he says. None of Prof. Cameron's introductions are more spirited or brighter than this and no other displays a more critical and appreciative sense. Loti is introduced in living colors and each of the stories in the book has its own fitting introduction. A few more notes might perhaps be found desirable in spite of the fact that Loti's style is clear. It seems to me that a scarcity of notes and an enthusiastic overflow of words which almost drown the sense in some parts of his introduction are the weakest points in this otherwise excellent book. A bibliography adds to its general attractiveness.

W. U. VREELAND.

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